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Two new species and additional records of micropterous *Paederus* from China and Taiwan (Coleoptera: Staphylinidae: Paederinae)

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A b s t r a c t : Two species of *Paederus* FABRICIUS, 1775 from China and Taiwan are described and illustrated: *Paederus* (*Gnathopaederus*) *furcillatus* nov.sp. (China: Guizhou) and *P.* (*Megalopaederus*) *nigricrus* nov.sp. (Taiwan: Taitung Hsien). Additional records of eight species of *Harpopaederus* SCHEERPELTZ, 1957 (two species), *Gnathopaederus* CHAPIN, 1927 (one species), *Megalopaederus* SCHEERPELTZ, 1957 (three species), and of the *P. biacutus* group (two species) are reported. The genus is currently represented in China and Taiwan by 51 and 25 species respectively.

K e y w o r d s : Coleoptera, Staphylinidae, Paederinae, *Paederus*, *Gnathopaederus*, *Megalopaederus*, China, Taiwan, taxonomy, new species, additional records.

Introduction

According to SCHÜLKE & SMETANA (2015), the genus *Paederus* FABRICIUS, 1775 is represented in China and Taiwan by 46 and six species, respectively. These species are assigned to six subgenera, with 13 species listed as incertae sedis. Although published only recently, these figures are now completely outdated since, in the meantime, one subgenus has been synonymized, *Megalopaederus* SCHEERPELTZ, 1957 (previously regarded as a distinct genus) has been attributed to *Paederus* as a subgenus, three species-group names have been synonymized, and as many as 22 new species have been described (ASSING 2015a, b; PENG, LI, LI & GU 2015; PENG, LI & ZHAO 2015, LI Q.-L. et al. 2016). Thus, prior to the present study, *Paederus* was represented in China and Taiwan by the following subgenera and species numbers: *Eopaederus* SCHEERPELTZ, 1957 (nine species, two of them also in Taiwan); *Gnathopaederus* CHAPIN, 1927 (seven species in China); *Harpopaederus* SCHEERPELTZ, 1957 (15 species in China); *Heteropaederus* SCHEERPELTZ, 1957 (one species recorded from both China and Taiwan); *Megalopaederus* (18 species; all of them confined to Taiwan); *Paederus* (six species; five of them in China and three in Taiwan). Additional 16 species from China are regarded as incertae sedis, seven¹ of which are currently attributed to the *Paederus biacutus* group. For an updated catalogue of the *Harpopaederus* species recorded from China see ASSING (2015b). A key to the micropterous *Paederus* species of China was recently provided by LI Q.-L. et al. (2016).

¹ *Paederus nanlingensis* PENG & LI, 2016 was originally not assigned to any subgenus or species group. However, since the authors stress that it is closely allied to *P. volutobliquus*, a representative of the *P. biacutus* group, it is attributed to this group, too.

Recently examined material of *Paederus* from China and Taiwan included not only additional records of eight previously described species, but also two new species, one of *Gnathopaederus* from China (Guizhou) and one of *Megalopaederus* from Taiwan.

Material and methods

The material treated in this study is deposited in the following collections:

NMP.....National Museum of Natural History, Praha (J. HÁJEK)

cAss.....author's private collection

cSme.....private collection Aleš Smetana, Ottawa (now in National Science Museum Tokyo)

The morphological studies were conducted using a Stemi SV 11 microscope (Zeiss Germany) and a Jenalab compound microscope (Carl Zeiss Jena). The images were created using a photographing device constructed by Arved Lompe (Nienburg) and CombineZ software, as well as a digital camera (Nikon Coolpix 995).

Body length was measured from the anterior margin of the mandibles (in resting position) to the abdominal apex, the length of the forebody from the anterior margin of the mandibles to the posterior margin of the elytra, head length from the anterior margin of the frons to the posterior margin of the head, elytral length at the suture from the apex of the scutellum to the posterior margin of the elytra, and the length of the aedeagus from the apex of the dorsal plate or the parameres (whichever forms the apex of the aedeagus) to the base of the aedeagal capsule. The "parameral" side (i.e., the side where the sperm duct enters) is referred to as the ventral, the opposite side as the dorsal aspect.

Results

Paederus parvidenticulatus LI, ZHOU & SOLODOVNIKOV, 2013

Material examined: China: Guizhou: 1♀, Leishan Xian, Leigong Shan, 26°23'N, 108°12'E, 1900-2170 m, V-VI.2012, leg. Hackel & Šehnal (cAss).

Comment: The known distribution of this species, a representative of the *P. biacutus* group, is confined to the Maoer Shan in Guangxi, the Leigong Shan and "Jiangkou County" in Guizhou, and the environs of Nanfengmian in Hunan (LI L.-Z. et al. 2013; LI Q.-L. et al. 2016; PENG et al. 2014).

Paederus volutobliquus LI, ZHOU & SOLODOVNIKOV, 2013

Material examined: China: Guangdong: 10 exs., Danxia Shan National Park, Wo Long Gang, 25°01'N, 113°45'E, 100 m, leg. Hájek & Růžicka (NMP, cAss).

Comment: The above specimens represent the first record since the original description, which is based on four type specimens from "Guangdong Province, Mountain Danxia" (LI L.-Z. et al. 2013, PENG et al. 2014).

***Paederus (Harpopaederus) konfuzius* WILLERS, 2001**

Material examined: China: Shaanxi: 1♂, 1♀, 65 km S Xi'an, 2200-2500 m, 2.-10.VIII.1998, leg. Cavazzuti (cSme, cAss).

Comment: Based on currently available evidence, *P. konfuzius* is endemic to the Qinling Shan in Shaanxi (ASSING 2015b).

***Paederus (Harpopaederus) chinensis* BERNHAUER, 1931**

Material examined: China: Sichuan: 9 exs., 37 km N Baoxing, Qiao Qi, Jiabin National Forest Park, 30°41'N, 102°42'E, 2480 m, 14.-16.VI.2014, leg. Hájek et al. (NMP, cAss); 4♂♂, 1♀, Wolong National Nature Reserve, Namasi vill., 31°01'N, 103°10'E, 2150 m, stream valley with shrubs, 23.VI.2014, leg. Hájek & Růžicka (NMP, cAss); 2♀♀, Wolong National Nature Reserve, Wolong vill., 31°02'N, 103°11'E, 1975 m, wet ruderal meadow, baited pitfall trap, 23.-26.VI.2014, leg. Hájek & Růžicka (NMP); 1♂, Wolong National Nature Reserve, Yinchanggou vill. env., Panda Valley, 30°58'N, 103°07'E, 2120 m, stream valley, 24.VI.2014, leg. Hájek & Růžicka (NMP).

Comment: Confirmed records of *P. chinensis* were previously known from five localities in West Sichuan (ASSING 2015b; LI Q.-L. et al. 2016).

***Paederus (Gnathopaederus) bursavacua* WILLERS, 2001**

Material examined: China: Chongqing: 2♂♂, 6♀♀, Jinpo Shan, 29°01'N, 107°14'E, 1750 m, 27.VI.1998, leg. Smetana (cSme, cAss).

Comment: This species was originally described from the Jinpo Shan in Chongqing and subsequently recorded also from the Kuankuoshui Natural Reserve and Dashaha in Guizhou (LI Q.-L. et al. 2016; PENG et al. 2015).

***Paederus (Gnathopaederus) furcillatus* nov.sp. (Figs 1-17)**

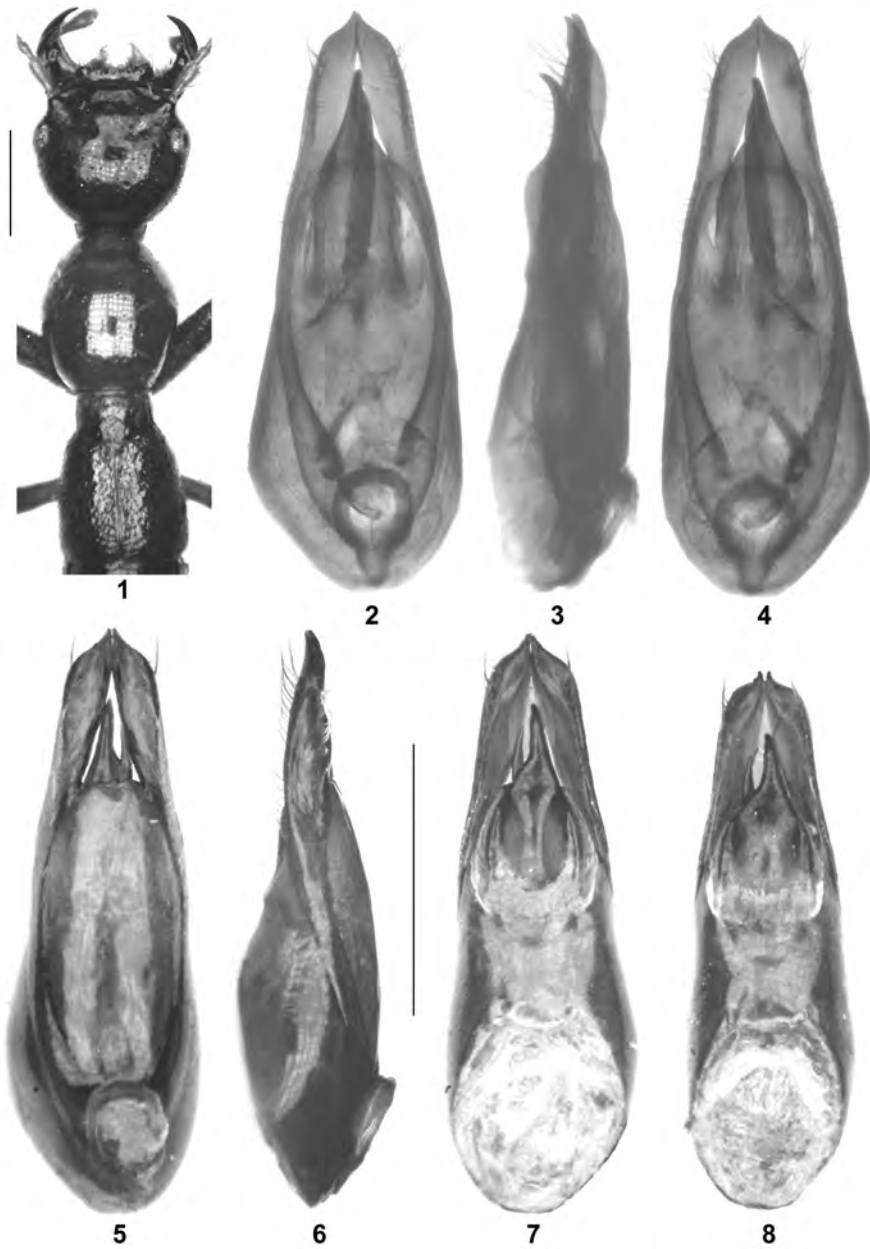
Type material: Holotype ♂: "S China SE-Guizhou Leishan Xian: Leigong Shan, 1900-2170 m, V-VI.2012 26°23,187' N 108°12,173' E lgt. M. Hackel & K+R. Sehnal / Holotypus ♂ *Paederus furcillatus* sp.n. det. V. Assing 2015" (cSme). Paratypes: 2♂♂, 1♀: same data as holotype (cSme, cAss).

Etymology: The specific epithet is an adjective derived from the Latin noun *furcilla* (fork) and alludes to the shape of the male mandibles.

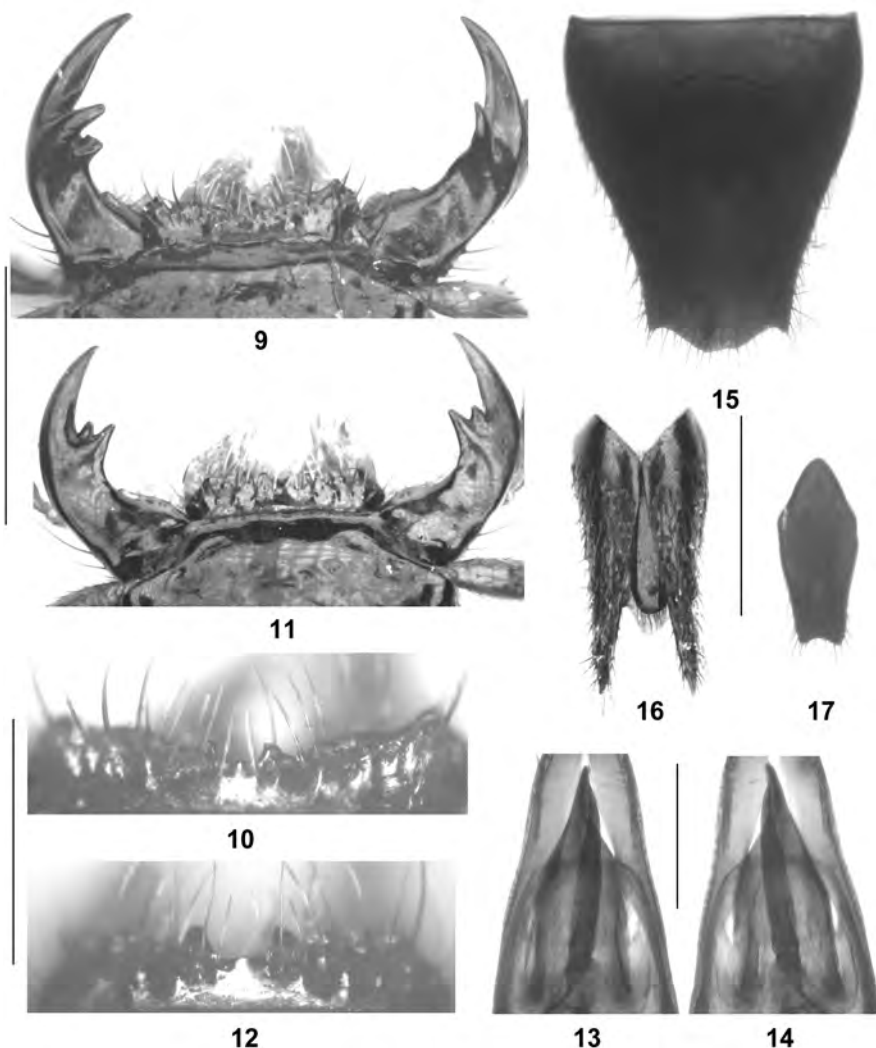
Description: Body length 11.0-12.5 mm; length of forebody 5.6-5.9 mm. Coloration: head black; pronotum red to dark-red; elytra metallic-blue; scutellum dark-red with the posterior portion infuscate; abdomen bicoloured with segments III-VI pale-reddish and segments VII-X black; legs blackish-brown with the basal third to two-fifths of the meso- and metafemora reddish; antennae dark-brown with antennomeres I-III and the apical 3-4 antennomeres yellowish-red; maxillary palpi yellowish-red.

Head (Fig. 1) moderately transverse, 1.05-1.12 times as broad as long; punctuation moderately sparse and moderately fine, sparse in median dorsal portion; interstices without microsculpture. Eyes approximately half as long as distance from posterior margin of eye to posterior constriction of head. Antenna 3.5-3.8 mm long. Labrum and mandibles with sexual dimorphism.

Pronotum (Fig. 1) approximately 1.15 times as long as broad and 0.87-0.92 times as broad as head, strongly convex in cross-section; punctuation sparse and fine, not forming dorsal series; midline broadly impunctate.



Figs 1-8: *Paederus furcillatus* nov.sp.: (1) forebody; (2-4) aedeagus in lateral, ventral, and dorsal view (in transparent light); (5-8) aedeagus in lateral, ventral, and dorsal view (in dry preparation). Scale bars: 1.0 mm.



Figs 9-17: *Paederus furcillatus* nov.sp.: (9) anterior portion of male head; (10) male labrum; (11) anterior portion of female head; (12) female labrum; (13-14) median portion of aedeagus ventral and in dorsal view (in transparent light); (15) female sternite VIII; (16) female tergites IX and X; (17) female sternite IX. Scale bars: 9, 11, 15-17: 1.0 mm; 10, 12-14: 0.5 mm.

Elytra (Fig. 1) 0.63-0.68 times as long as pronotum and slender, approximately as broad as pronotum; humeral angles obsolete; punctation moderately coarse, dense, and somewhat ill-defined; interstices without microsculpture. Hind wings completely reduced. Protarsomeres I-IV moderately dilated, without sexual dimorphism. Metatarsomere I approximately as long as the combined length of II and III.

Abdomen broader than elytra; punctation moderately coarse and moderately dense on tergites III–VI, finer and sparser on tergites VII and VIII; pubescence moderately long and pale; interstices with fine transverse microsculpture; posterior margin of tergite VII without palisade fringe; tergite VIII with weakly pronounced sexual dimorphism.

♂: anterior margin of labrum with a short blunt tooth on either side of the narrow median notch, laterally weakly sinuate and with a weakly pronounced lateral tooth (Fig. 9); both mandibles with a pronounced erect and broad-based horn (Fig. 9); tergite VIII strongly convex posteriorly; aedeagus (Figs 2–8, 13–14) 2.00–2.15 mm long (including parameres); ventral process apically convex, in the middle truncate in ventral view; dorsal plate slightly asymmetric, basally strongly excavate in the middle and with bulging lateral margins, apically extending into a spine-shaped process, apex distinctly curved dorsad in lateral view; internal sac with a long sclerotized spine apically extending nearly to apex of dorsal plate.

♀: anterior margin of labrum with a blunt tooth on either side of the rather broad median notch and with a weakly pronounced lateral tooth (Fig. 11); mandibles with a bifid median molar tooth (Fig. 11); tergite VIII weakly convex or truncate in the middle; posterior margin of sternite VIII with a convex median projection (Fig. 17); sternite IX with weakly concave posterior margin (Fig. 17); tergites IX and X as in Fig. 16.

Comparative notes: Based on the morphology of the male mandibles, this species belongs to the subgenus *Gnathopaederus* CHAPIN, 1927, which previously included eight species, six of them micropterous, distributed in China and Thailand (PENG et al. 2015). Regarding its external and sexual characters (coloration of the legs and antennae; habitus and body proportions; shape of the labrum; general morphology of the aedeagus; shapes of the female sternites VIII and IX), the new species is most similar to *P. yunnanensis* WILLERS, 2001 from West Yunnan and *P. xuei* PENG & LI, 2015 from southeastern Yunnan. It differs from both of them as follows:

from *P. yunnanensis* by the shapes of the male and female labrum (*P. yunnanensis*: on either side of the shallower median notch with a less pronounced tooth, laterally with an additional tooth), by the shape of the male and female mandibles (*P. yunnanensis*: both male mandibles with a smaller dorsal process, left mandible with a stouter and apically blunter molar tooth; female mandibles with a more broad-based and apically more deeply bifid molar tooth), by the morphology of the aedeagus (*P. yunnanensis*: dorsal plate apicad more abruptly narrowed in dorsal view and apically not distinctly curved dorsad in lateral view; parameres apically more gradually narrowed; internal spine shorter, far from reaching apex of dorsal plate), by the less strongly convex posterior margin of the female sternite VIII, and by the less concave posterior margin of the female sternite IX;

from *P. xuei* by the shapes of the male and female labrum (*P. xuei*: laterally with an additional tooth), by the shape of the male and female mandibles (*P. xuei*: both male mandibles with a smaller dorsal process, left mandible with a distinctly bifid, less stout molar tooth; female mandibles with a more broad-based and apically more deeply bifid molar tooth), by the morphology of the aedeagus (*P. xuei*: dorsal plate apicad more abruptly narrowed in dorsal view; parameres with shorter apices; internal spine much shorter, far from reaching apex of dorsal plate), by the broadly convex posterior margin of the female sternite VIII (*P. xuei*: obtusely pointed in the middle), and by the more broadly concave posterior margin of the female sternite IX.

For illustrations of the external and sexual characters of *P. yunnanensis* and *P. xuei* see PENG et al. (2015).

Distribution and natural history: The type locality is situated in the Leigong Shan, southeastern Guizhou. The specimens were collected at an altitude between 1900 and 2170 m, together with *P. parvidenticulatus*.

***Paederus (Megalopaederus) flavoterminalis* CAMERON, 1949**

Material examined: Taiwan: 6♂♂, 3♀♀, Nantou Hsien, Meifeng, 2130 m, 4.V.1998, leg. Smetana [T199] (cSme, cAss); 6♀♀, same data, but 2.V.1998 [T196] (cSme, cAss).

Comment: The known distribution of *P. flavoterminalis* is confined to several localities in Nantou Hsien, Taiwan (ASSING 2015a).

***Paederus (Megalopaederus) excisissimus* ASSING, 2015**

Material examined: Taiwan: 1♂, 4♀♀, Kaohsiung Hsien, road above Tona Forest Station, 1850 m, 19.IV.1998, leg. Smetana [T191] (cSme, cAss); 7♀♀, Kaohsiung Hsien, road above Tona Forest Station, km 16-17, 1700-1800 m, 28.IV.1998, leg. Smetana [T190] (cSme, cAss).

Comment: This species was previously known only from the type locality at Peinantashan trail, Pingtung Hsien, Taiwan (ASSING 2015a).

***Paederus (Megalopaederus) incurvatus* ASSING, 2015**

Material examined: Taiwan: 1♂, 1♀, Kaohsiung Hsien, Peinantashan trail, 2080 m, 2.V.1995, leg. Smetana [T169] (cSme, cAss); 1♂, Kaohsiung Hsien, Peinantashan trail, 2500 m, 3.V.1995, leg. Smetana [T1171] (cSme); 1♀, 1 ex. [half eaten by *Anthrenus* sp.], Kaohsiung Hsien, road above Tona Forest Station, km 16-17, 1700-1800 m, 28.IV.1998, leg. Smetana [T190] (cSme); 1♂, Kaohsiung Hsien, road above Tona Forest Station, 1850 m, 19.IV.1998, leg. Smetana [T191] (cSme).

Comment: This species had been recorded from several localities along the Peinantashan Trail and one in Kuanshan (Taiwan: Kaohsiung Hsien) at altitudes of 2000-2500 m (ASSING 2015a). In two localities it was collected together with *P. excisissimus*.

***Paederus (Megalopaederus) nigricrus* nov.sp. (Figs 18-31)**

Type material: Holotype ♂: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung 850 m 26.IV.1995, A. Smetana [T166] / Holotypus ♂ *Paederus nigricrus* sp.n. det. V. Assing 2016" (cSme). Paratypes: 1♀: same data as holotype (cAss); 1♀: same data, but "800 m, 27.IV.1995... [T168]" (cSme); 1♀: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung [sic] 800 m 18.IV.1998 A. Smetana [T183]" (cSme); 1♀: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung [sic] 800 m 18.IV.1998 A. Smetana [T183]" (cSme); 1♀: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung 900 m 19.IV.1998 A. Smetana [T184]" (cSme); 1♂, 2♀♀ [1♀ partly eaten by *Anthrenus* sp.]: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung 750 m 21.IV.1998 A. Smetana [T185]" (cSme, cAss); 1♀: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung 550-600 m 22.IV.98 A. Smetana [T187]" (cSme); 7♂♂, 8♀♀ [3 exs. partly eaten by *Anthrenus* sp.]: "TAIWAN, Taitung Hsien, Hsinkangshan above Chengkung 800 m 17-22.IV.98 Lise Robillard [T188]" (cSme, cAss).

Etymology: The specific epithet is a noun in apposition composed of the Latin adjective *niger* (black) and the Latin noun *crus* (leg). It alludes to the completely black femora and tarsi.

Description: Body length 8.5-12.0 mm; length of forebody 4.5-5.2 mm. Coloration: head black; pronotum red; elytra metallic-blue; scutellum red to dark-brown anteriorly and blackish posteriorly; abdomen black except for the yellowish basal halves of segments IX and X; legs black with brown tarsi; antennae blackish with the apical 3-5 antennomeres reddish to brown; maxillary palpi black with the apical palpomere yellowish to pale-brown.

Head (Fig. 18) transverse, 1.12-1.20 times as broad as long; punctuation moderately sparse and moderately coarse, only slightly sparser in median dorsal portion; interstices without microsculpture. Eyes 0.5-0.6 times as long as distance from posterior margin of eye to posterior constriction of head. Antenna (Fig. 19) 3.2-3.8 mm long. Labrum with distinctly concave anterior margin, with a semicircular to U-shaped median incision, with a broad lateral projection on either side, and with a small projection on either side of the median incision; mandibles each with bifid molar tooth of similar shape.

Pronotum (Fig. 18) 0.95-1.03 times as broad as long and 1.02-1.08 times as broad as head, strongly convex in cross-section; punctuation moderately dense and moderately coarse; midline broadly impunctate.

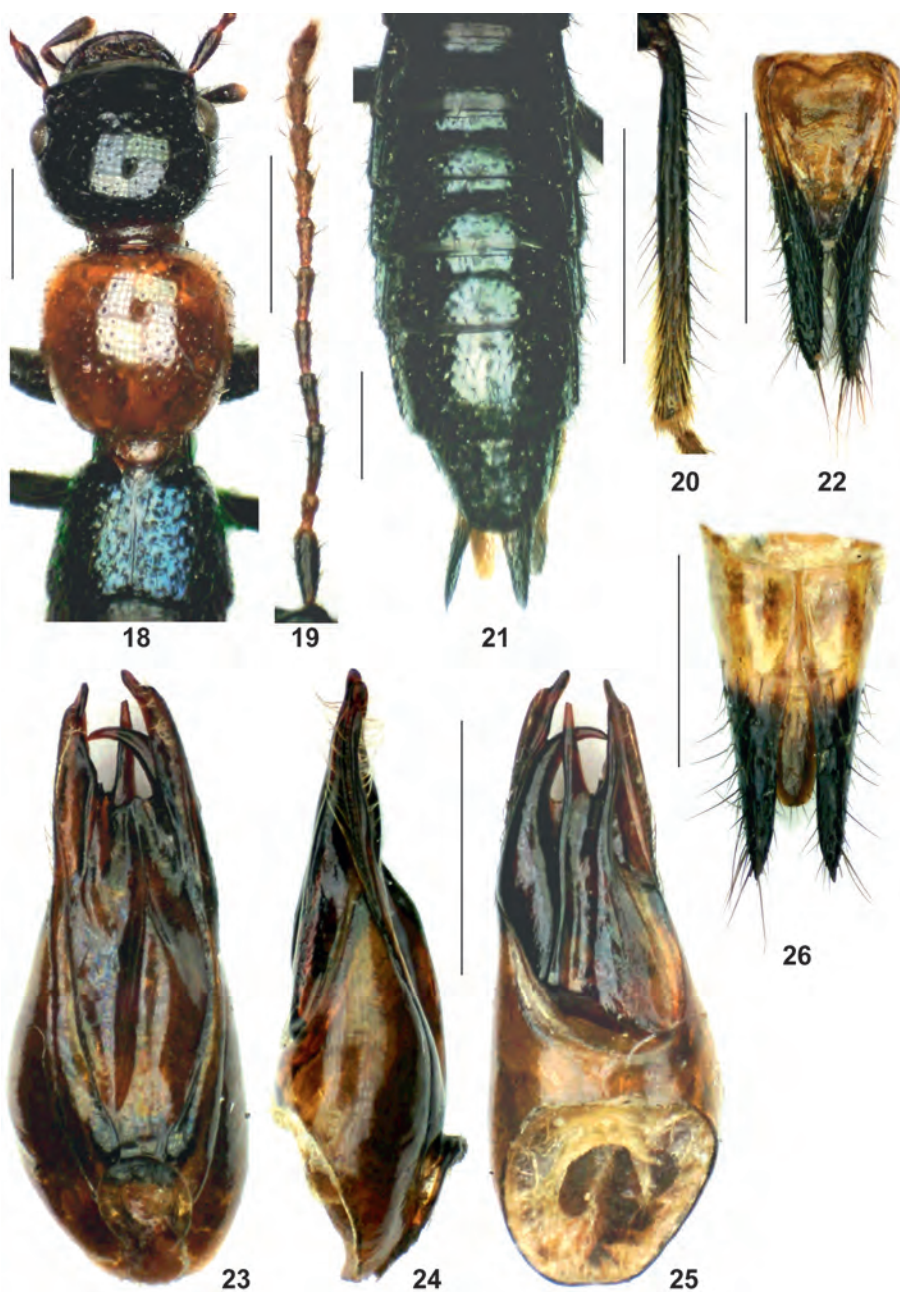
Elytra (Fig. 18) 0.55-0.59 times as long as pronotum and of trapezoid shape; humeral angles obsolete; punctuation coarse, dense, and somewhat ill-defined; interstices without microsculpture. Hind wings completely reduced. Protarsomeres I-IV with moderate sexual dimorphism. Mesotibiae with dense yellowish setae apically (Fig. 20); metatarsomere I approximately as long as, or slightly longer than the combined length of metatarsomeres II and III.

Abdomen (Fig. 21) broader than elytra; punctuation moderately coarse and moderately dense; pubescence long and black; interstices with fine microsculpture; posterior margin of tergite VII without palisade fringe; tergite VIII with pronounced sexual dimorphism.

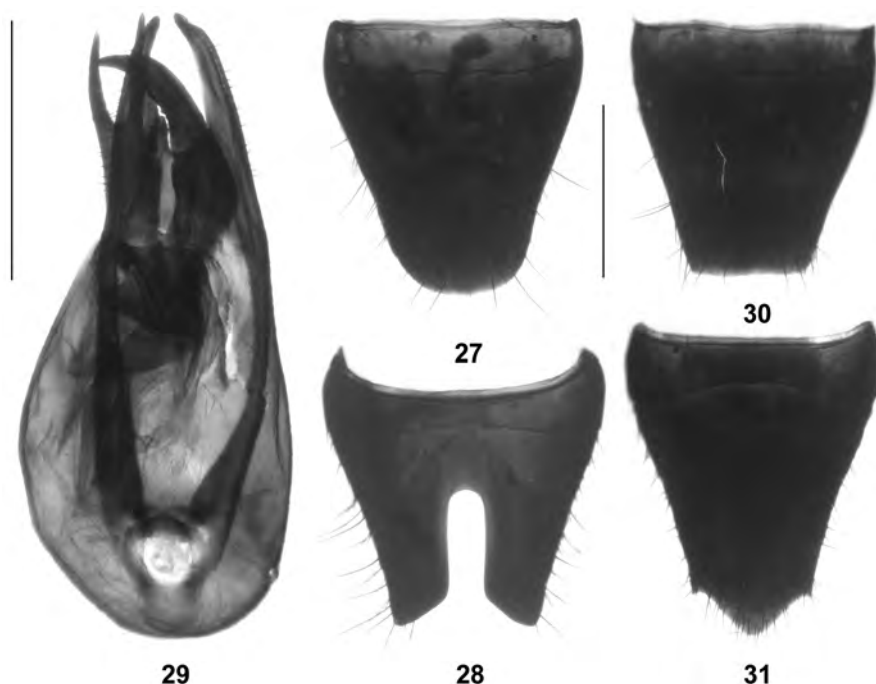
♂: protarsomeres I-IV distinctly dilated; tergite VIII (Fig. 27) with strongly convex posterior margin; sternite VII without clusters of setae, with an impunctate patch in the middle, and with a broadly concave posterior margin; sternite VIII (Fig. 28) with deep posterior excision, its depth 0.55-0.60 times the length of sternite; tergites IX-X as in Fig. 26; aedeagus (Figs 23-25, 29) 2.3-2.6 mm long; ventral process short, with pronounced median excision, and with an acute process on the left (ventral view); parameres of similar shape and length, apically abruptly narrowed; dorsal plate strongly sclerotized and strongly asymmetric, with three conspicuous apical processes, the left one stout and strongly curved, the median one acute and the right one of similar length, acute, and weakly curved; internal sac without spines.

♀: protarsomeres I-IV distinctly dilated, but less so than in male; posterior margin of tergite VIII truncate (Fig. 30); sternite VIII (Fig. 31) oblong, posterior margin broadly, triangularly produced; segments IX-X as in Fig. 22.

Comparative notes: *Paederus nigrircus* is somewhat intermediate between the two previously identified species groups of *Megalopaederus* in Taiwan (see ASSING 2015a). It shares the moderately slender antennae and the absence of clusters of dense setae on the male sternite VII with the species of the *P. formosanus* group, which includes 15 described species. However, based on the red pronotum without microsculpture, the absence of setae in the median portion of the male sternite VII, the absence of spines in the internal sac of the aedeagus, as well as on the habitat (relatively low altitudes), *P. nigrircus* is assigned to the *P. kosempoensis* group, which previously comprised three described species. The new species is distinguished from all its congeners by



Figs 18-26: *Paederus nigrircus* nov.sp.: (18) forebody; (19) antenna; (20) mesotibia; (21) abdomen; (22) female segments IX-X; (23-25) aedeagus in ventral, lateral, and dorsal view (in dry preparation); (26) male segments IX-X. Scale bars: 1.0 mm.



Figs 27-31: *Paederus nigrircus* nov.sp.: (27) male tergite VIII; (28) male sternite VIII; (29) aedeagus in ventral view in transparent light; (30) female tergite VIII; (31) female sternite VIII. Scale bars: 1.0 mm.

the morphology of the aedeagus, particularly the conspicuous apical processes of the dorsal plate, from the species of the *P. formosanus* group additionally by a reddish pronotum without microsculpture, and from the species of the *P. kosempoensis* group by less slender antennae, the chaetotaxy of the male sternite VII, completely black femora, and the coloration of the abdominal segments IX-X.

In order to account for *P. nigrircus*, the key to the *Megalopaederus* species of Taiwan in ASSING (2015a) is modified as follows:

2. Head and pronotum without trace of microsculpture, glossy2a
- Head and pronotum at least with shallow microsculpture and with more or less reduced shine5
- 2a. Antennae less slender; antennomeres IV–VIII approximately three times as long as broad (Fig. 19). Femora completely black. Male sternite VII without clusters of dense setae. Dorsal plate of aedeagus with three apical processes of distinctive shapes (Figs 23-25, 29).....*P. nigrircus*
- Antennae conspicuously slender; antennomeres IV–VIII distinctly more than three times as long as broad (ASSING 2015a: figures 53-55). Femora basally yellowish. Male sternite VII with a of cluster of dense setae on either side of middle (ASSING 2015a: figures 204, 207); aedeagus with broad and apically not elongated dorsal plate3

Distribution and natural history: The specimens were collected in several close localities in the Hsinkangshan, Taitung Hsien, Taiwan. The altitudes range from approximately 550 to 900 m.

Acknowledgements

I am indebted to the colleagues listed in the material section for the loan of the material that this study is based on. Joachim Willers (Berlin) forwarded *Megalopaederus* material from the Smetana collection to me. Zhong Peng (Shanghai) kindly proof-read the manuscript.

Zusammenfassung

Zwei Arten der Gattung *Paederus* FABRICIUS, 1775 aus China und Taiwan werden beschrieben und abgebildet: *Paederus* (*Gnathopaederus*) *furcillatus* nov.sp. (China: Guizhou) und *P.* (*Megalopaederus*) *nigriscrus* nov.sp. (Taiwan: Taitung Hsien). Weitere Nachweise von acht Arten der Untergattungen *Harpopaederus* SCHEERPELTZ, 1957 (zwei Arten), *Gnathopaederus* CHAPIN, 1927 (eine Art) und *Megalopaederus* SCHEERPELTZ, 1957 (drei Arten) sowie der *P. biacutus*-Gruppe (drei Arten) werden gemeldet. *Paederus* ist derzeit in China und Taiwan mit 51 bzw. 25 Arten vertreten.

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